

SECTION 426

PRESSURE GROUTING PORTLAND CEMENT CONCRETE PAVEMENT

426.01. DESCRIPTION.

This work shall consist of pumping a fly ash cement grout under portland cement concrete pavement. The grout shall fill the voids beneath the pavement with a mixture that will form a hard, insoluble mass. The grout shall be pumped through injection holes cored through the pavement slabs.

426.02. MATERIALS.

Materials shall meet the requirements specified in Subsection 733.09.

426.03. EQUIPMENT.

- (a) **Grouting Equipment.** The equipment used for pressure grouting shall consist of at least the following:
- (1) **Measuring and Proportioning Equipment.** Furnish measuring and proportioning equipment to accurately measure and proportion by weight the materials composing the grout. Prepackaged materials may be used as approved by the Engineer.
 - (2) **Batch Mixing Tank.** The batch mixing tank shall be watertight, containing a high speed mixer capable of blending the materials into a homogenous mixture. The mixer shall be equipped with a rotor operating in close proximity to a stator, creating a high shearing action. The mixing pump shall have a circulation capacity greater than 250 gallons per minute (950 L/min.) providing recirculation of the materials through the mixer and the mixing tank.
 - (3) **Holding Tank.** Furnish a holding tank with a paddle-type agitator to be used between the batch mixing tank and the grout pump for continuous operation. The agitator shall ensure complete circulation to keep the grout in suspension and remove air bubbles from the mix.
 - (4) **Grout Pump.** Furnish a grout pump consisting of a single acting plunger pump with a high-speed back stroke. The pump shall be equipped with precise pressure and capacity control valves which allow the presetting of both maximum pressure and flow independently. Whenever the preset pressure is reached, the pump shall automatically stop and maintain that pressure without fluctuation. The pump shall facilitate a capacity range of 0 to 30 gallons per minute (110 L/min.) and a pressure range of 0 to 100 psi (690 kPa).
 - (5) **Discharge Line.** The discharge line shall be furnished with a positive cutoff valve at the nozzle end, which will have a nozzle or device that will remain secure in the cored holes and be free of leaks.
 - (6) **Lift Measuring Device.** Equipment to measure slab lift shall be capable of determining movement at the outside slab corner adjacent to a joint. The device shall be a standard Benkelman Beam or other approved equipment and have the capability of making such measurement of 0.001 inch (0.025 mm).
- (b) **Coring Equipment.** Furnish coring equipment capable of cutting 2 inch (50 mm) diameter holes through the concrete pavement, and operate it so as to prevent damage to the pavement from excessive down pressure.

NOTE: Air driven or hydraulic impact drills will not be allowed.

426.04. CONSTRUCTION METHODS.

- (a) **General.** Exercise sufficient precautions during all operations to ensure that slabs are not broken or cracked.

NOTE: Any slabs cracked or broken during this operation shall be replaced at the Contractor's expense.

- (b) **Weather Limitations.** Do not start pressure grouting unless the ambient temperature is at least 35°F (2°C) and rising; and stop if the temperature is 45°F (7°C) and falling. The temperature of the pavement while pressure grouting shall not be less than 35°F (2°C).
- (c) **Coring Holes.** Core 2 inch (50 mm) diameter injection holes through the pavement at locations and depths shown on the Plans. The hole pattern and spacing may be modified by the Engineer. If there are irregular or unsatisfactory holes which cannot be satisfactorily used in pressure grouting, temporarily plug them or fill them with grout, and do not measure them for payment. Instead, core new holes. Do not core more holes than can be grouted during the same day, unless specific approval is given by the Engineer.
- (d) **Clearing Holes.** After the holes are cored to the depths shown on the Plans, and within 10 minutes of pumping the grout, clean the holes of debris to provide a passage for the grout. Do this by inserting a pipe nozzle into the holes and applying sufficient water pressure to clean the holes.
- (e) **Grouting.** The grout flow rate while pumping shall be a maximum of 7 gallons per minute (26.5 L/min.) at the pump head. The nozzle of the grout discharge hose shall be secured in the hole in a manner that provides a seal adequate to maintain the grout pressure underneath the slab. The nozzle end shall not extend below the bottom of the concrete. Pumping shall continue in a hole until the slab corner is lifted 0.032 to 0.036 inches (0.825 to 0.925 mm), or until the pressure gauge in the discharge line indicates a pressure exceeding 60 psi (414 kPa). If the slab does not lift and there is no pressure buildup, then pumping shall continue until the amount of clear grout flowing up through joints or cracks equals the amount of grout injected. Repeat this procedure in other holes until it is clear that all voids have been filled.

During pumping, pay close attention to the lift measuring device to prevent rapid lift of the slabs or substantial raising of the adjacent shoulders. Provide personnel and equipment to satisfactorily control the lift on every slab that is pressure grouted. Temporary plugging of adjacent holes may be required during pumping operations.

- (f) **Permanently Sealing Holes.** Remove all grout from the holes and fill them with a stiff sand-cement mortar composed of one part portland cement to three parts fine aggregate, by volume, or a commercial quality premixed rapid set mixture.

NOTE: Filled holes that ravel out or become damaged shall be repaired at the Contractor's expense.

- (g) **Regrouting.** If, in the judgment of the Engineer, a slab may benefit from additional grouting, regrout any such slab. Core new holes for regrouting as specified by the Engineer.

- (h) **Clean Up.** Remove deposits of grout on the pavement or shoulders, and clean the surface before traffic is permitted on the completed sections. Remove other debris, bags, spillage, etc., from the right-of-way each day.
- (i) **Opening to Traffic.** Restrict traffic from the grouted slabs for three days.

426.05. METHOD OF MEASUREMENT.

Core holes shall be measured by each.

Portland cement incorporated into the grouting mix will be measured by the ton (metric ton).

Fly ash incorporated into the grouting mix will be measured by the ton (metric ton).

Water used in the grout mix will not be measured for payment.

426.06. BASIS OF PAYMENT.

The accepted quantities of cored holes, portland cement and fly ash, measured as provided above, will be paid for at the contract unit price as follows:

- (A) CORED HOLES EACH
- (B) PORTLAND CEMENT TON (METRIC TON)
- (C) FLY ASH TON (METRIC TON)

Such payment shall be full compensation for furnishing all materials, equipment, labor and incidentals to complete the work as specified.

SECTION 433**RUBBLIZING PORTLAND CEMENT CONCRETE PAVEMENT****433.01. DESCRIPTION.**

This work shall consist of rubblizing and seating existing portland cement concrete (PCC) pavement.

433.03. EQUIPMENT.

- (a) **Pavement Breaker.** Rubblizing shall be accomplished with a self-contained, self-propelled, resonant frequency pavement rubblizing unit capable of producing low amplitude 2000 pound (9 kN) force blows at a rate of not less than 44 cycles per second. The unit shall also be equipped with a water mist system to suppress dust generated by the operation. The rubblizing unit shall be capable of delivering such energy as may be necessary to satisfactorily fracture the pavement. A screen satisfactory to the Engineer shall be provided to protect vehicles in the adjacent lane from flying chips during the fracturing process when necessary.
- (b) **Roller.** Use a vibratory, steel wheel roller weighing a minimum of 10 tons (9 metric tons) to compact the rubblized pavement. The self-propelled unit shall be capable of varying both the vibration amplitude and frequency.